

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

I. Introduction

The specification was amended in the same manner as in the parent application to correct obvious typos. Claims 1-2 and 20-26 are cancelled. Claims 3, 4, 5, 11, 13, 14, 15, 17 and 18 are currently being amended. Claims 27-31 are being added. After amending the claims as set forth above, claims 3-19 and 27-31 are now pending in this application. Support for the amendments and for the new claims may be found throughout the specification, such as originally filed claim 4 and page 6, lines 6-8 and page 13, line 31 to page 14, line 5 of the specification. No new matter was added.

II. The § 112 Rejections Should Be Withdrawn

Claims 5, 13, 15 and 18 have been rejected under § 112, ¶ 2 as being indefinite. This rejection is respectfully traversed. Applicants submit that these claims are provided in a proper means plus function form of 35 USC § 112, ¶ 6. Specifically, Applicants submit that the term “changing an amount of said acid solution added” is a proper function of the means. The claimed means corresponds to an acid pump 61 and its equivalents described in the specification and in the Figures (see Figure 12 and page 13, line 31 to page 14, line 5, for example). The acid pump provides an acid solution into the liquid and optionally changes the amount of the solution provided based on the pH of the solution detected by the pH detector 62. Thus, one of the functions of the acid pump 61 is to change the amount of the acid solution that the pump adds to the solution.

Applicants also submit that the term “means for adjusting pH” is a proper function of the means. The claimed second means corresponds to an acid pump 68 and its equivalents described in the specification and in the Figures (see Figure 12 and page 13, lines 14-20, for

example). The function of the acid pump 68 is to adjust the pH of the liquid, such as by providing an acid solution into the liquid. This function is recited in claims 13, 15 and 18.

The examiner is respectfully invited to contact the undersigned representative if further clarification of the claim terms are required.

III. The Prior Art Rejections Should Be Withdrawn

Claims 3-19 have been rejected under § 102(b) and §103(a) over Mills, alone or in combination with secondary references. These rejections are respectfully traversed.

A. Claims 3, 11, 14, 17 and 31

Independent claims 3, 11, 14 and 17 have been amended to recite “a first device for adding an acid solution to said liquid before said liquid is brought into contact with said photocatalyst such that, prior to said irradiating, a pH of said liquid is made to be lower than an isoelectric point of said photocatalyst”. Claim 31 recites this limitation in means plus function form of §112, ¶ 6. Mills does not teach or suggest such a device or means. Thus, Mills does not anticipate these claims.

Furthermore, the apparatus of claims 3, 11, 14, 17 and 31 is also not obvious over Mills for the following reasons. A device for adding acid solution to the liquid was previously recited in claim 4. In paragraph 6 of the Office Action, the examiner rejected claim 4 which recited a device for adding acid solution to the liquid as allegedly being obvious over Mills because “an adjustment of a known effective variable of a known or obvious process within the capabilities of one having ordinary skill in the art.” Applicants respectfully disagree.

1. No Routine Optimization

First, the presently pending claims are apparatus rather than method claims. Thus, the difference between the claimed apparatus and the apparatus of Mills is not a range that could be optimized but the lack of the claimed device for adding an acid solution in the apparatus of Mills. Therefore, the “adjustment of a known variable” rationale for supporting the §103(a)

rejection is not applicable to the pending apparatus claims since there is no corresponding feature in the apparatus of Mills which can be optimized.

Second, a “particular parameter must first be recognized as a result effective variable. i.e., a variable which achieves a recognized result, before a determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.” MPEP § 2144.05(II)(B) (citing *In re Antonie*, 195 USPQ 6 (CCPA 1977)). In the present case, there is no disclosure in Mills which shows that Mills recognizes acid addition to control the pH of the liquid as a result effective variable. Therefore, “adjustment of a known effective variable” cannot be used as a rationale for supporting the §103(a) rejection because Mills did not recognize acid addition to control pH of the liquid as a result effective variable.

The secondary references do not remedy the deficiency of Mills. Thus, applicants submit that the office has not established a *prima facie* case of obviousness.

2. Unexpected Results

Even if the Office Action established a *prima facie* case of obviousness, then this case is rebutted by the unexpected results achieved by the claimed apparatus. The claimed first device or means provides an acid solution into the liquid to make the pH of the liquid lower than the isoelectric point of the photocatalyst.

Under this claimed condition, it becomes possible to unexpectedly and efficiently decompose bromate ions (BrO_3^-). This is proved by the results shown in Fig. 17 and described on page 22, lines 19-30 of the specification. TiO_2 and SrTiO_3 have respective isoelectric points of 5.6 and 8.6 (see Table 2 on page 6 of the specification). Fig. 17 shows bromate ion (BrO_3^-) concentration of a liquid having a pH of 7. The pH of 7 is higher than the isoelectric point of TiO_2 (5.6), but lower than the isoelectric point of SrTiO_3 (8.6). As shown in Figure 17, the bromate ion (BrO_3^-) concentration of the liquid was significantly reduced in a short time by SrTiO_3 (isoelectric point higher than the pH), but not significantly reduced by TiO_2 (isoelectric point lower than the pH). Therefore, when the pH of the liquid is lower than the isoelectric point, the bromate ion (BrO_3^-) concentration is unexpectedly reduced to a much greater degree than when the pH of the liquid is higher than the isoelectric

point. Applicants submit that this unexpected result is sufficient to rebut a *prima facie* case of obviousness.

B. Claim 19

Claim 19 recites a first means for adjusting pH of the liquid to allow the removing of carbonic acid. Mills does not teach or suggest adjusting pH of said liquid to allow the removing of carbonic acid.

The Office Action states that claim 19 is obvious "because a duplication of parts was held to be obvious." However, Mills does not teach any means for adjusting pH of the liquid to allow the removing of carbonic acid. Thus, claim 19 does not duplicate any corresponding part that is taught by Mills. Therefore, the rationale for the rejection of claim 19 is improper and a withdrawal of the rejection is respectfully requested.

IV. Conclusion

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

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By 

FOLEY & LARDNER LLP
Customer Number: 22428
Telephone: (202) 672-5300
Facsimile: (202) 672-5399

Leon Radomsky
Attorney for Applicant
Registration No. 43,445

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.